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Improving vesicular integrity and antioxidant activity of novel mixed soy lecithin-based liposomes containing squalene and their stability against UV light

ABSTRACT

In order to improve the membrane lipophilicity and the affinity towards the environment of lipid bilayers, squalene (SQ) could be conjugated to phospholipids in the formation of liposomes. The effect of membrane composition and concentrations on the degradation of liposomes prepared via the extrusion method was investigated. Liposomes were prepared using a mixture of SQ, cholesterol (CH) and Tween80 (TW80). Based on the optimal conditions, liposome batches were prepared in the absence and presence of SQ. Their physicochemical and stability behavior were evaluated as a function of liposome constituent. From the optimization study, the liposomal formulation containing 5% (w/w) mixed soy lecithin (ML), 0.5% (w/w) SQ, 0.3% (w/w) CH and 0.75% (w/w) TW80 had optimal physicochemical properties and displayed a unilamellar structure. Liposome prepared using the optimal formulation had a low particle size (158.31 ± 2.96 nm) and acceptable %increase in the particle size (15.09% ± 3.76%) and %trolox equivalent antioxidant capacity (%TEAC) loss (35.69% ± 0.72%) against UV light treatment (280–320 nm) for 6 h. The interesting outcome of this research was the association of naturally occurring substance SQ for size reduction without the extra input of energy or mechanical procedures, and improvement of vesicle stability and antioxidant activity of ML-based liposome. This study also demonstrated that the presence of SQ in the membrane might increase the acyl chain dynamics and decrease the viscosity of the dispersion, thereby limiting long-term stability of the liposome.

Keyword: Liposome integrity; Squalene; Membrane composition; Photodegradation; X-ray diffraction